

SPARTAN Measurements for the MAIA Mission & SPARTAN Data Dashboard



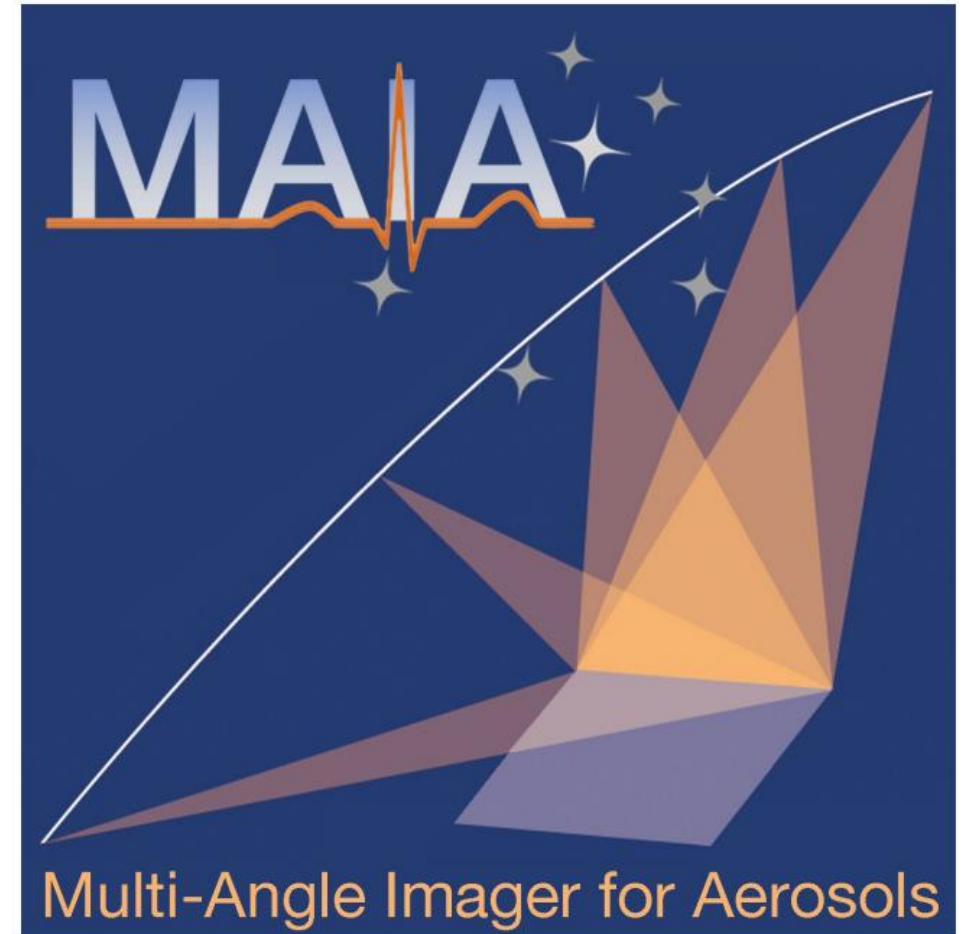
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MAIA Earth Venture Instrument Investigation

- MAIA was selected in 2016 as a NASA **Earth Venture Instrument (EVI)** investigation with a primary emphasis on societal benefit.
- MAIA's EVI objective is to link exposure to **different PM types** (mixtures of particles having different sizes, shapes, and compositions) with **human health**.
- MAIA applies and extends current satellite-based methodologies to enable **mapping of speciated PM** in selected metropolitan areas around the world.
- **NASA** and the **Italian Space Agency (ASI)** are partnering on the MAIA mission, with ASI contributing the **host spacecraft, launch, and complementary science**.
- Satellite launch: **~2025**
- Baseline flight mission duration: **3** years



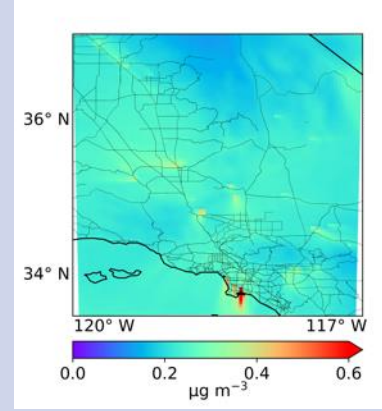
Key Elements of MAIA-EVI Investigation



Satellite instrument



Surface monitor network

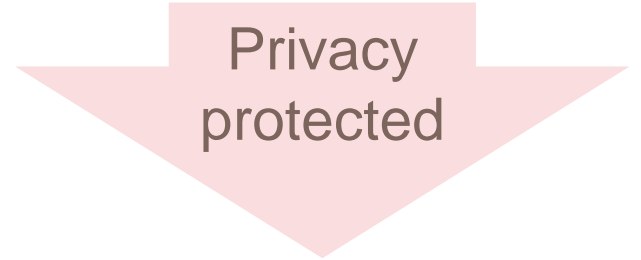


Chemical transport model



Health records

(Completed in)
(October 2022)



Daily concentration maps of PM_{10} , $\text{PM}_{2.5}$,
speciated $\text{PM}_{2.5}$ at 1-km spatial resolution

Epidemiological
studies

Birth, death, and
hospitalization data

- Sulfate
- Nitrate
- OC
- EC
- Dust

Current MAIA-EVI Target Areas

Primary Target Areas

- USA-LosAngeles
- USA-Atlanta
- USA-Boston
- ESP-Barcelona
- ITA-Rome
- ZAF-Johannesburg
- ISR-TelAviv
- ETH-AddisAbaba
- IND-Delhi
- CHN-Beijing
- TWN-Taipei

Calibration/Validation Target Areas

- USA-RailroadValley
- MRT-Mauritania1
- NAM-Gobabeb
- LBY-Libya4

Secondary Target Areas

- USA-Hilo
- PAC-OceanStCu
- USA-SanFrancisco
- USA-Phoenix
- USA-Denver
- MEX-MexicoCity
- CAN-Toronto
- PER-Lima
- CHL-Santiago
- PRI-SanJuan
- BRA-SãoPaulo
- SEN-Dakar
- GHA-Accra
- ATL-OceanStCu
- NGA-Lagos
- ZAF-CapeTown
- ITA-Milan
- ITA-Taranto
- SRB-Belgrade
- KEN-Nairobi
- ETH-Harar
- KWT-KuwaitCity
- PAK-Karachi
- IND-Chennai
- BGD-Dhaka
- THA-Bangkok
- VNM-Hanoi
- MNG-Ulaanbaatar
- RUS-Yakutsk
- KOR-Seoul
- AUS-Sydney

MAIA Investigation is Target Based



Target area dimensions: 360 km x 480 km

Primary Target Areas (PTAs) are chosen by the MAIA Science Team for conducting and supporting the MAIA health studies

Secondary Target Areas (STAs) are areas of interest (e.g., cities with major pollution, aerosol source regions, climatically important cloud regimes), but where health studies are not mandated

MAIA-EVI Surface PM Monitors

Where available, MAIA project collects data from existing ground-based PM monitoring networks



Existing monitoring networks

MAIA project is deploying additional surface PM monitors in selected target areas to augment existing monitoring networks



SS5-PM_{2.5} filter-based sampler



Aerosol Mass and Optical Depth (AMOD)



microAeth MA350 aethalometer



PA-II-SD

Vendor

Various vendors

AirPhoton
(SPARTAN network)

Colorado State University

AethLabs

PurpleAir

Pollutants

PM_{2.5} speciation, total PM_{2.5}, total PM₁₀

PM_{2.5} speciation

PM_{2.5} speciation

Black carbon

Total PM_{2.5}

Target areas

All target areas

CHN-Beijing (x1)
ETH-AddisAbaba (x1)
IND-Delhi (x1)
ISR-TelAviv (x2)
TWN-Taipei (x2)
USA-Los Angeles (x1)
ZAF-Johannesburg (x2)

CHN-Beijing (x1)
ETH-AddisAbaba (x2)
IND-Delhi (x3)
TWN-Taipei (x2)
USA-Atlanta (x1)
USA-Los Angeles (x1)
ZAF-Johannesburg (x1)

CHN-Beijing (x1)
ETH-AddisAbaba (x2)
IND-Delhi (x1)
USA-Los Angeles (x1)

ETH-AddisAbaba (x10)

Although launch of the satellite instrument is not expected until 2025, surface PM measurements are being collected prior to launch to establish baseline pollution levels and exercise MAIA's ground data processing software.

MAIA-SPARTAN Sites

MAIA-SPARTAN sampling protocol: 24-hr integrated sample during a single day, multiple times per week

Haifa, Israel

Technion Israel Institute
of Technology



Rehovot, Israel

Weizmann Institute



New Delhi, India

IIT Delhi



Kaohsiung, Taiwan

Kaohsiung Medical
University



Taipei, Taiwan

NTUNHS



Johannesburg, S. Africa

University of Johannesburg
Kingsway Campus



Pasadena, USA

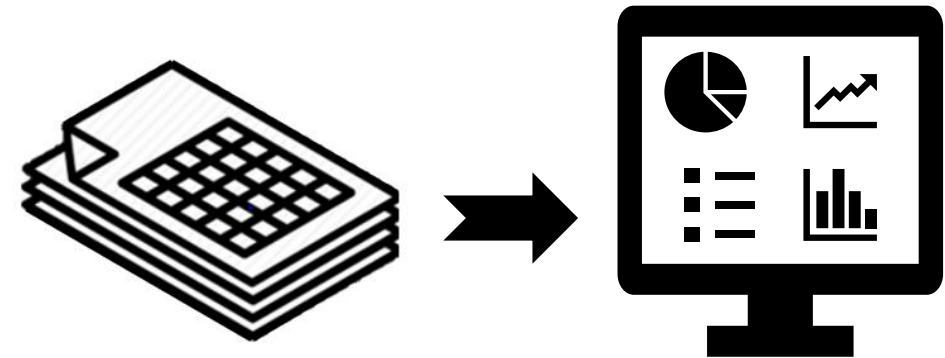
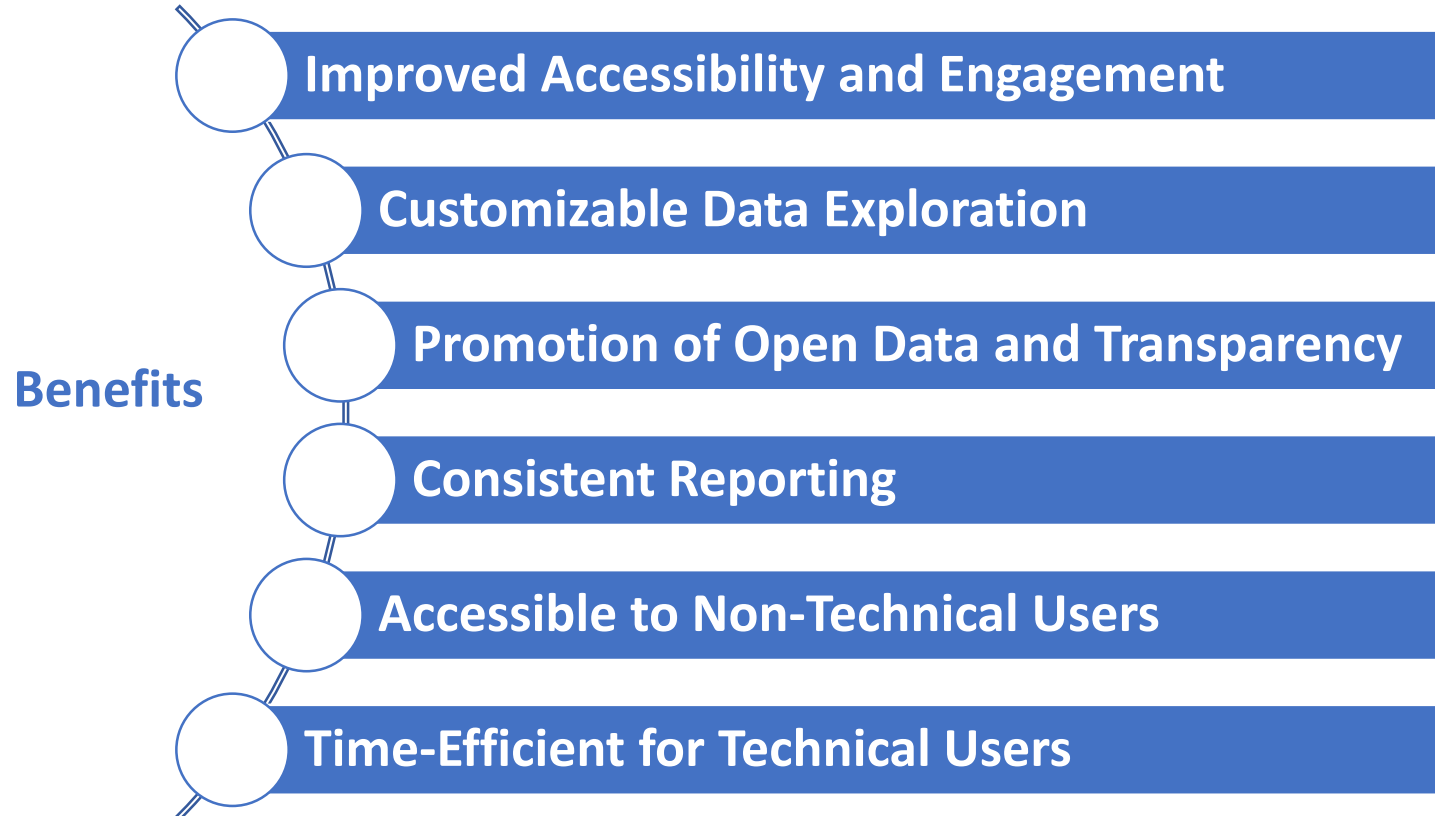
Jet Propulsion Laboratory



Note: These photos are examples of the operational sites; they do not depict all MAIA-SPARTAN sites.

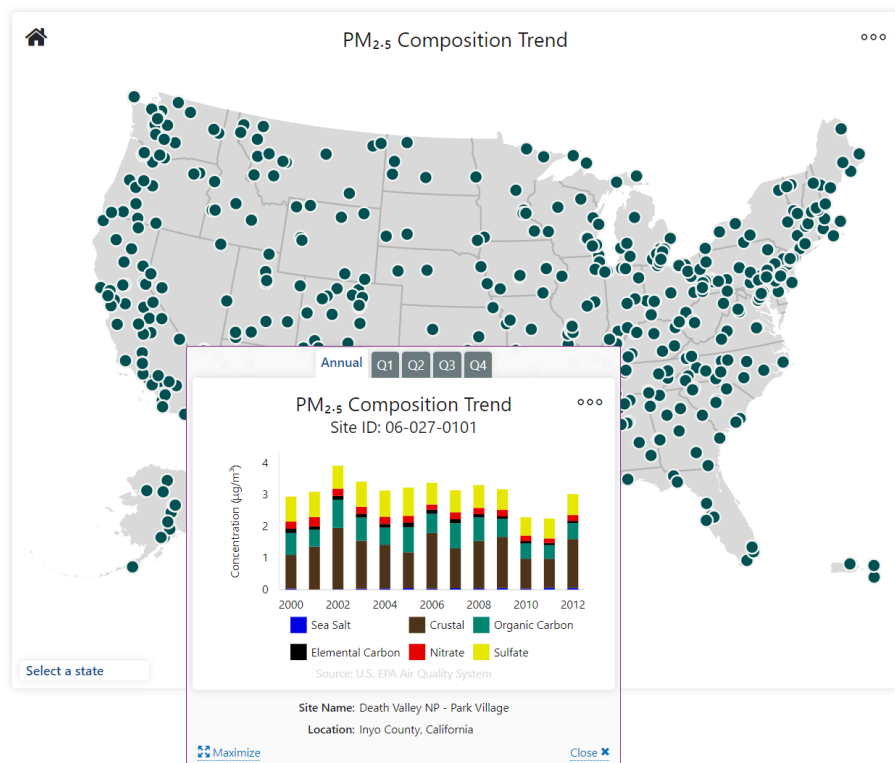
SPARTAN Data Dashboard: A Visual Journey into Actionable Insights

- **SPARTAN generates valuable, consistent speciated PM_{2.5} data globally, benefiting researchers, policymakers, educators, and citizen scientists.**
- **A web-based interactive data dashboard can unlock the full potential of this valuable dataset.**

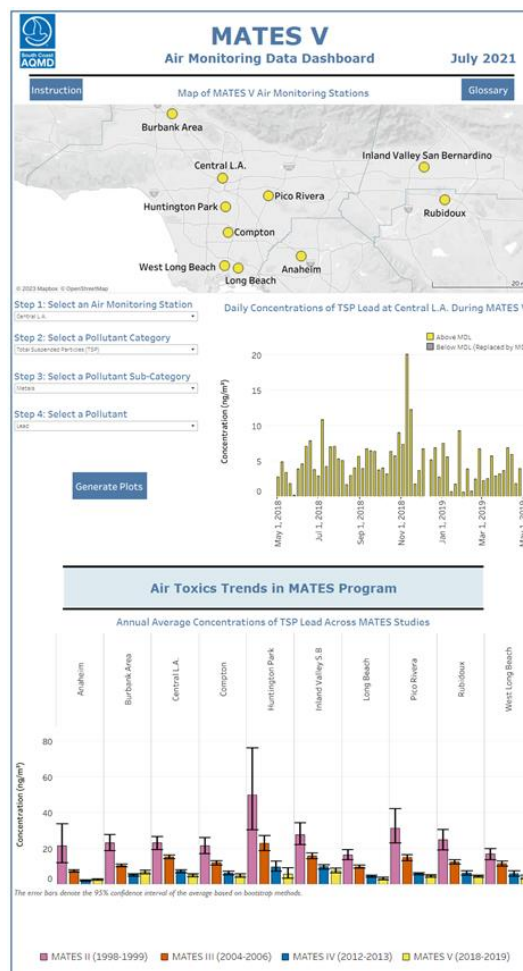


Examples of Air Quality Data Dashboards

EPA Our Nation's Air Report



South Coast AQMD MATES V Report



Federal Land Manager Environmental Database IMPROVE Data Dashboard

